TAXON 23(2/3): 225-226. MAY 1974

ORIGIN AND EVOLUTION OF THE EUKARYOTIC CELL

INTRODUCTION

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Summary of Symposium

The following papers and abstracts represent a symposium held on 11 August 1973 at the First International Congress of Systematic and Evolutionary Biology (ICSEB), Boulder, Colorado:

Introduction, by LYNN MARGULIS

I. Evolutionary significance of cell division phenomena in Protists
   a. Nonphotosynthetic Protists, by KARL GRELL
   b. Photosynthetic Protists, by JEREMY PICKETT-HEAPS

II. Implications and extensions of the serial endosymbiosis theory of the origin of eukaryotes, by F. J. R. TAYLOR

III. Two billion years of prokaryotic cells and the emergence of eukaryotes, by ELSO S. BARGHOORN

IV. How many are the kingdoms of organisms?, by GORDON F. LEEDALE

INTRODUCTION

The following collection of papers and abstracts represent a symposium presented August 11, 1973 at the first International Congress of Systematic and Evolutionary Biology (ICSEB), Boulder, Colorado. The symposium was organized to discuss the consequences for higher taxa (Kingdoms, Phyla and Classes) of new concepts of the origin and early evolution of eukaryotes. Responding to the remarks of fellow panelists and a lively audience, Drs. Taylor and Leedale have expanded their oral contributions into original papers dealing directly with the implications for the traditional "plant-animal" dichotomy of new work on the autonomy of cell organelles and the biological diversity in protists. Drs. Pickett-Heaps[1] and Grell presented fascinating observations concerning unique life cycle and cell division phenomena in chlorophyte algae and foraminiferans respectively. Since most of the work referred to in their two talks is in press or has already been published elsewhere these authors have summarized their major points in abstract form and have included only the relevant references. The most probable time scale for the major events in the early evolution of cells was discussed by Dr. Barghoorn whose abstract is followed by references to primary relevant micropaleontological literature. In his oral presentation Dr. Barghoorn cautioned clearly against over-interpretation of the Precambrian microfossil record.

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1. Dr. J. Pickett-Heaps has subsequently expanded his abstracted contribution into a full manuscript "Evolution of Mitosis and the Eukaryotic Condition" (1974), *Biosystems*, in press.

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Although nearly all modern biologists today agree with Stanier's assertion that the major evolutionary discontinuity in biology is between the prokaryotes and eukaryotes (Stanier *et al.*, 1970) the working biological community retains the zoological-botanical division and the blue green algae are still excluded from that bible of microbiology, Bergey's manual (Breed *et al.*, 1957). Organisms such as *Ochromonas* and *Euglena* are classified into mutually exclusive taxa above that of genus by botanists following the International Code of Botanical Nomenclature and by, for example, protozoologists (Honigberg *et al.*, 1964). If intelligent young scholars are to develop respect for modern systematics of eukaryotes that are neither eumetazoa nor eumetaphyta these issues must be faced squarely by active professionals in the artificially divided "sciences" of "lower eukaryotes": protozoology, phycology, mycology, protistology and the like. Leedale considers the possibility of some 18 monophyletic kingdoms; Taylor argues for two – prokaryotes and eukaryotes. Although it may require minor modifications (Margulis, 1971, 1974) I believe that Whittaker's five kingdom approach (Whittaker, 1969) with one prokaryote kingdom (monera) and four eukaryote kingdoms (protists, fungi, animals and plants) will ultimately be recognized as phylogenetically sound and practically useful. More important than any individual scheme, however, is the larger issue: that discussion of these critical taxonomic problems and identifications of the sort of information required to solve them is encouraged in the professional literature. It must be recognized that not only in molecular biology and biochemistry but in the whole of biology our paradigms are changing. These provocative papers are aired in *Taxon* in the hope that systematics of the "lower organisms" will be practised as a science and will integrate knowledge from all sources relevant to the understanding of evolutionary histories. No longer can we afford to consider anaerobic methanogenic bacteria, slime net amoebae and actinomycetes "non-photosynthetic plants" without recognizing that there is a problem.

We solicit your response to the issues raised by this symposium; it is hoped that discussion will be continued at the 1979 ICSEB meeting.

Acknowledgement

The aid to the National Aeronautics and Space Administration (NASA NGR-004-025) in support of this entire symposium is gratefully acknowledged.

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